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NASA/SP—1998-7011/SUPPL478
November 16, 1998

AEROSPACE MEDICINE AND BIOLOGY

A CONTINUING BIBLIOGRAPHY WITH INDEXES

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53 Behavioral Sciences 5

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Typical Report Citation and Abstract

1. 19970001126 NASA Langley Research Center, Hampton, VA USA
2. Water Tunnel Flow Visualization Study Through Pedestall of 12 Novel Planform Shapes
3. Gatlin, Gregory M., NASA Langley Research Center, USA Neuhart, Dan H., Lockheed Engineering and Sciences Co., USA.
4. Mar. 1996, 130p, In English
5. Contract(s)/Grant(s): RTOP 505-68-70-04
6. Report No(s): NASA-TM-4663, NAS 1.15:4663, L-17418, No Copyright, Avail: CASI, A07, Hardcopy, A02, Microfiche
7. To determine the flow field characteristics of 12 planform geometries, a flow visualization investigation was conducted in the Langley 16- by 24-Inch Water Tunnel. Concepts studied included flat plate representations of diamond wings, twin bodies, double wings, cutout wing configurations, and serrated forebodies. The off-surface flow patterns were identified by injecting colored dyes from the model surface into the free-stream flow. These dyes generally were injected so that the localized vortical flow patterns were visualized. Photographs were obtained for angles of attack ranging from 10° to 80°, and all investigations were conducted at a test section speed of 0.25 ft per sec. Results from the investigation indicate that the formation of strong vortices on highly swept forebodies can improve poststall lift characteristics, however, the asymmetric bursting of these vortices could produce substantial control problems. A wing cutout was found to significantly alter the position of the forebody vortex on the wing by shifting the vortex inboard. Serrated forebodies were found to effectively generate multiple vortices over the configuration. Vortices from 65° swept forebody serrations tended to roll together, while vortices from 40° swept serrations were more effective in generating additional lift caused by their more independent nature.
8. Author
9. *Water Tunnel Tests; Flow Visualization; Flow Distribution; Free Flow; Planforms; Wing Profiles; Aerodynamic Configurations*

Key

1. Document ID Number, Corporate Source
2. Title
3. Author(s) and Affiliation(s)
4. Publication Date
5. Contract/Grant Number(s)
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9. Subject Terms

AEROSPACE MEDICINE AND BIOLOGY

A Continuing Bibliography (Suppl. 478)

NOVEMBER 16, 1998

51
LIFE SCIENCES (GENERAL)

19980222493 National Inst. of Environmental Health Sciences, National Toxicology Program, Research Triangle Park, NC USA
Short Term Reproductive and Developmental Toxicity of Tribromoacetic Acid (CAS No. 75-96-7) Administered in Drinking Water to Sprague-Dawley Rats: *Final Report*

Jul. 28, 1998; 388p; In English

Report No.(s): PB98-165111; RDGT-94009; No Copyright; Avail: CASI; A17, Hardcopy; A04, Microfiche

The potential toxicity of tribromoacetic acid (TBA; CAS No. 75-96-7) was evaluated using a short-term reproductive and developmental toxicity screen. This study design was selected to identify the process (development, female reproduction, male reproduction, various somatic organs/processes) that is the most sensitive to tribromoacetic acid exposure. The dose range-finding study was conducted at concentrations of 0, 30, 100, 300, and 900 ppm of TBA in the drinking water for two weeks. Based on decreased water consumption in the 900 ppm males and females, the dose levels of 0, 10, 70, and 400 ppm (Groups 1, 2, 3, and 4, respectively) were selected for the main study, which utilized two groups of male rats designed as Group A (non-BrdU treated animals, 10 rats in Groups 1, 2, 3, and 4) and Group B (BrdU-treated, 5 rats in Groups 1, 2, and 3, and 8 rats in Group 4), and three groups of female rats, designed as Group A (peri-conception exposure, 10 rats in Groups 1, 2, 3, and 4), Group B (gestational exposure), and Group C (peri-conception exposure, BrdU-treated, 5 rats in Groups 1, 2, and 3, and 8 animals in Group 4). Control animals received deionized water, the vehicle.

NTIS

Toxicity; Reproduction (Biology); Bromine Compounds; Acetic Acid; Potable Water; Animals

19980223026 Iowa Univ., Depts. of Psychology, Iowa City, IA USA
Chemical Topography of Efferent Projections from the Median Preoptic Nucleus to Pontine Monoaminergic Cell Groups in the Rat

Zardetto-Smith, Andrea M., Iowa Univ., USA; Johnson, Alan Kim, Iowa Univ., USA; Neuroscience Letters; 1998; ISSN 0304-3940; Volume 199, pp. 215-219; In English; Original contains color illustrations

Contract(s)/Grant(s): NAGS-6171; NRSA F32HL-08349; NIH-HL-14388; NIH-HL-44546; NAGw-4388; Copyright; Avail: Issuing Activity; Hardcopy; Microfiche

This study examined efferent output from the median preoptic nucleus (MnPO) to pontine noradrenergic and serotonergic cell groups using an anterograde tracing technique (Phaseolus vulgaris leucoagglutinin, PHA-L) combined with glucose oxidase immunocytochemistry to serotonin (5-HT) or to dopamine-(beta)-hydroxylase (DBH). Injections of PHA-L into the ventral MnPO resulted in moderate axonal labeling within the region of the B7 and B8 serotonergic groups in the dorsal raphe. PHA-L labeled fibers and punctate processes were observed in close apposition to many of the 5-HT immunoreactive neurons in these regions. In contrast, sparse terminal labeling was found within the B5 group in the raphe pontis nucleus, and only trace fiber labeling observed in the B3 and B6 groups. Efferents from the MnPO also provided moderate innervation to the A6 and A7 noradrenergic groups. PHA-L labeled punctate processes were found most frequently in close apposition to DBH-immunoreactive neurons at mid- to caudal levels of the locus coeruleus. Some labeled axons were also present within the A7 and A5 groups. Additionally, a close apposition between labeled MnPO efferents and 5-HT fibers within the lateral parabrachial nucleus was observed. The results indicate the MnPO provides a topographic innervation of monoaminergic groups in the upper brainstem.

Author

Chemical Analysis; Examination; Cells (Biology); Locus; Glucose

19980223027 Maine Univ., Dept. of Biochemistry, Walpole, ME USA
Regulation of Methane Oxidation in a Freshwater Wetland by Water Table Changes and Anoxia
Roslev, Peter, Maine Univ., USA; King, Gary M., Maine Univ., USA; FEMS Microbiology Ecology, 1996, ISSN 0168-6496, Volume 19, pp. 105-115, In English
Contracts/Grants: NSF BSR-91-07315, NAGw-1746, EU-EU5V-CT-94-0499
Report No(s): DMC-Contrib-288, Copyright, Avail: Issuing Activity, Hardcopy, Microfiche

The effects of water table fluctuations and anoxia on methane emission and methane oxidation were studied in a freshwater marsh. Seasonal aerobic methane oxidation rates varied between 15% and 76% of the potential diffusive methane flux (diffusive flux in the absence of aerobic oxidation). On an annual basis, approximately 43% of the methane diffusing into the oxic zone was oxidized before reaching the atmosphere. The highest methane oxidation was observed when the water table was below the peat surface. This was confirmed in laboratory experiments where short-term decreases in water table levels increased methane oxidation but also net methane emission. Although methane emission was generally not observed during the winter, stems of soft rush (Juncus effusus) emitted methane when the marsh was ice covered. Indigenous methanotrophic bacteria from the wetland studied were relatively anoxia tolerant. Surface peat incubated under anoxic conditions maintained 30% of the initial methane oxidation capacity after 32 days of anoxia. Methanotrophs from anoxic peat initiated aerobic methane oxidation relatively quickly after oxygen addition (1-7 hours). These results were supported by culture experiments with the methanotroph Methylosinus trichosporium OB3b. This organism maintained a greater capacity for aerobic methane oxidation when starved under anoxic compared to oxic conditions. Anoxic incubation of M. trichosporium OB3b in the presence of sulfide (2 mM) and a low redox potential (-110 mV) did not decrease the capacity for methane oxidation relative to anoxic cultures incubated without sulfide. The results suggest that aerobic methane oxidation was a major regulator of seasonal methane emission from the investigated wetland. The observed water table fluctuations affected net methane oxidation presumably due to associated changes in oxygen gradients. However, changes from oxic to anoxic conditions in situ had relatively little effect on survival of the methanotrophic bacteria and thus on methane oxidation potential per se.
Author
Methane; Oxidation; Anoxia; Water Tables; Organisms; Marshlands; Fresh Water

19980223028 Maine Univ., Darling Marine Center, Walpole, ME USA
In Situ Analyses of Methane Oxidation Associated with the Roots and Rhizomes of a Bur Reed, Sparganium Eurycarpum, in a Maine Wetland
King, Gary M., Maine Univ., USA; Applied and Environmental Microbiology, 1988, ISSN 0099-2240, Volume 62, No. 12, pp. 4548-4555, In English
Contracts/Grants: NAGw-1746, NSF DEB-91-07315, Copyright, Avail: Issuing Activity, Hardcopy, Microfiche

Methane oxidation associated with the belowground tissues of a common aquatic macrophyte, the burweed Sparganium eurycarpum, was assayed in situ by a chamber technique with acetylene or methyl fluoride as a methanotrophic inhibitor at a headspace concentration of 3% (v/v). Acetylene and methyl fluoride inhibited both methane oxidation and peat methanogenesis. However, inhibition of methanogenesis resulted in no obvious short-term effect on methane fluxes. Since neither inhibitor adversely affected plant metabolism and both inhibited methanotrophy equally well, acetylene was employed for routine assays because of its low cost and ease of use. Root-associated methanotrophy consumed a variable but significant fraction of the total potential methane flux; values varied between 1 and 58% (mean +/- standard deviation, 27.0% +/- 6.0%), with no consistent temporal or spatial pattern during late summer. The absolute amount of methane oxidized was not correlated with the total potential methane flux, this suggested that parameters other than methane availability (e.g., oxygen availability) controlled the rates of methane oxidation. Estimates of diffusive methane flux and oxidation at the peat surface indicated that methane emission occurred primarily through aboveground plant tissues; the absolute magnitude of methane oxidation was also greater in association with roots than at the peat surface. However, the relative extent of oxidation was greater at the latter locus.
Author
Chemical Analysis; Methane; Oxidation; Acetylene; Bacteria; Aquatic Plants

19980223029 Maine Univ., Darling Marine Center, Walpole, ME USA
Associations of Methanotrophs With the Roots and Rhizomes of Aquatic Vegetation
King, Gary M., Maine U..., USA; Applied and Environmental Microbiology, Sep. 1994, ISSN 0099-2240, Volume 60, No. 9, pp. 3220-3227, In English
Contracts/Grants: NAGw-1746, NSF DEB-91-07315, NAGw-1428, Copyright, Avail: Issuing Activity, Hardcopy, Microfiche

Results of an in vitro assay revealed that root-associated methane consumption was a common attribute of diverse emergent wetland macrophytes from a variety of habitats. Maximum potential uptake rates (Vsub maxp) varied between about 1 and 10 micro mol g(-1) (dry weight) h, with no obvious correlation between rate and gross morphological characteristics of the plants. The Vsub maxp corresponded to about 2 x 10(exp 18) to 2 x 10(exp 9) methanotrophs g(-1)(dry weight), assuming that root-associated methanotrophs have cell-specific activities comparable to those of known isolates. Vsub maxp varied seasonally for an aquatic grass, Calamagrostis canadensis, and for the cattail, Typha latifolia, with highest rates in late summer. Vsub maxp was well correlated with ambient temperature for C. canadensis but weakly correlated for T. Wifolia. The seasonal changes in Vsub maxp, as well as inferences from apparent half-saturation constants for methane uptake (Ksub app), generally 3 to 6 micro M), indicated that oxygen availability might be more important than methane as a rate determinant. In addition, roots incubated under anoxic conditions showed little or no postanoxia aerobic methane consumption, indicating that root-associated methanotrophic populations might not tolerate variable oxygen availability. Hybridization of oligodeoxynucleotide probes specific for group 1 or group 2 methylotrophs also varied seasonally. The group 2-specific probe consistently hybridized to a greater extent than the group 1 probe, and the relative amount of group 2 probe hybridization to C. canadensis root extracts was positively correlated with Vsub maxp.

Author

Methane; Roots; Rhizomes; Aquatic Plants; Morphology; Vegetation

19980223031 Maine Univ., Dept. of Microbiology, Walpole, ME USA

Survival and Recovery of Methanotrophic Bacteria Starved Under Oxic and Anoxic Conditions

Roslev, Peter, Maine Univ., USA; King, Gary M., Maine Univ., USA; Applied and Environmental Microbiology; Jul. 1994; ISSN 0099-2240; Volume 60, No. 7, pp. 2602-2608; In English

Contracts/Grants(s): NAGw-3746; NSF BSR-91-07315; Copyright; Avail: Issuing Activity, Hardcopy, Microfiche

The effects of carbon deprivation on survival of methanotrophic bacteria were compared in cultures incubated in the presence and absence of oxygen in the starvation medium. Survival and recovery of the examined methanotrophs were generally highest for cultures starved under anoxic conditions as indicated by poststarvation measurements of methane oxidation, tetrazolium salt reduction, plate counts, and protein synthesis. Methylosinus trichosporium OB3b survived up to 6 weeks of carbon deprivation under anoxic conditions while maintaining a physiological state that allowed relatively rapid (hours) methane oxidation after substrate addition. A small fraction of cells starved under oxic and anoxic conditions (4 and 10%, respectively) survived more than 10 weeks but required several days for recovery on plates and in liquid medium. A non-spore-forming methanotroph, strain WP 12, displayed 36 to 118% of its initial methane oxidation capacity after 5 days of carbon deprivation. Oxidation rates varied with growth history prior to the experiments as well as with starvation conditions. Strain WP 12 starved under anoxic conditions showed up to 90% higher methane oxidation activity and 46% higher protein production after starvation than did cultures starved under oxic conditions. Only minor changes in biomass and morpholow were seen for methanotrophic bacteria starved tinder anoxic conditions. In contrast, starvation under oxic conditions resulted in morphology changes and an initial 28 to 35% loss of cell protein. These data suggest that methanotrophic bacteria can survive carbon deprivation under anoxic conditions by using maintenance energy derived Solely from an anaerobic endogenous metabolism. This capability could partly explain a significant potential for methane oxidation in environments not continuously, supporting aerobic methanotrophic growth.

Author

Bacteria; Survival; Recovery

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AEROSPACE MEDICINE

Includes physiological factors; biological effects of radiation; and effects of weightlessness on man and animals.

19980223934 Naval Aerospace Medical Research Lab., Pensacola, FL USA

Otolith Responses During Centrifugation Along Three Axes of Orientation

deGraaf, B., Institute for Human Factors TNO, Netherlands; Bos, J. E., Institute for Human Factors TNO, Netherlands; Groen, E., Institute for Human Factors TNO, Netherlands; Tielemans, W., Royal Netherlands Air Force, Netherlands; Ramecklers, F., Royal Netherlands Air Force, Netherlands; Mead, A. M., Naval Aerospace Medical Research Lab., USA; Guedry, F. E., University of West Florida, USA; Jun. 17, 1998; 24p; In English; Prepared in collaboration with Human Factors Research Inst., Netherlands and University of West Florida, Pensacola, FL.

Report No.(s): AD-A350656; NAMRL-1402; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Humans perceive tilt by the otoliths as a result of shear forces on the macular. The current study was designed to investigate the influence of forces from different directions on eye movements and tilt perception. The study was composed of experiments in a human centrifuge. In the first experiment, ocular torsion and experienced tilt due to centrifugal stimulation were assessed, with a maximum of 1.5 G acceleration along the X-, Y- and Z-axes. In the second experiment, the subjects' estimation of tilt was recorded during +1.0 G and -1.0 G centrifugal stimulation along the three axes of the body, with and without visual reference. Results of an earlier study suggested that the utriculus generates conjugate torsional eye movements, and the sacculus generates disjunctive torsional eye movements. This hypothesis found support in the present investigation when the behavior of the two eyes was determined simultaneously. A persistent underestimation of the subjects' tilt perception was registered during stimulation with centrifugal forces less than or equal 1.0 G. This underestimation of tilt appeared least during stimulation along the longitudinal axis (Z, gain: 0.87), and was more prominent during stimulation along the X- and Y-axes (gain: 0.56 and 0.60, respectively). The underestimation occurred even though a calibration procedure was used to control for the possible inadequacy of subjects to adjust intended angles by joy-stick indication. This procedure would exclude such a sensorimotor factor as a cause for the underestimation.
DTIC
Otolith Organs; Centrifuging; Human Factors Engineering; Centrifugal Force; Eye Movements; Responses

19980223984 Washington Univ., Seattle, WA USA
The Adaptive Effects of Virtual Interfaces: Vestibulo-Ocular Reflex and Simulator Sickness
Draper, Mark H., Washington Univ., USA; Aug. 07, 1998; 345p; In English
Report No.(s): AD-A350767; AFIT-98-021D; No Copyright; Avail: CASI; A15, Hardcopy; A03, Microfiche

Current virtual interfaces imperfectly simulate the motion dynamics of the real world. Conflicting visual and vestibular cues of self-motion are believed to result in vestibulo-ocular reflex (VOR) adaptations and simulator sickness, which raises health and safety issues surrounding virtual environment (VE) exposure. Four experiments were conducted to examine the effects of conflicting visual-vestibular cues through employment of typically occurring virtual interface scenarios. Subjects were exposed for 30 minutes to a head-coupled virtual interface, completing visual search tasks using active, unrestricted head movement rotations.
DTIC
Virtual Reality; Visual Perception; Motion Sickness; Flight Simulators; Reflexes

19980227403 NASA Langley Research Center, Hampton,VA USA
Aerospace Medicine and Biology: A Continuing Bibliography, Supplement 476
Oct. 19, 1998; 23p; In English
Report No.(s): NASA/SP-1998-7011/SUPPL476; NAS 1.21:7011/SUPPL476; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This supplemental issue of Aerospace Medicine and Biology, A Continuing Bibliography with Indexes (NASA/SP-1998-7011) lists reports, articles, and other documents recently announced in the NASA STI Database. In its subject coverage, Aerospace Medicine and Biology concentrates on the biological, physiological, psychological, and environmental effects to which humans are subjected during and following simulated or actual flight in the Earth's atmosphere or in interplanetary space. References describing similar effects on biological organisms of lower order are also included. Such related topics as sanitary problems, pharmacology, toxicology, safety and survival, life support systems, exobiology, and personnel factors receive appropriate attention. Applied research receives the most emphasis, but references to fundamental studies and theoretical principles related to experimental development also qualify for inclusion. Each entry in the publication consists of a standard bibliographic citation accompanied, in most cases, by an abstract.
CASI
Bibliographies; Aerospace Medicine; Biastronautics; Biological Effects; Exobiology; Indexes (Documentation)

19980227142 Naval Postgraduate School, Monterey, CA USA
Human Male and Female Biodynamic Response to Underwater Explosion Events
Oglesby, Douglas B., Naval Postgraduate School, USA; Jun. 1998; 162p; In English
Report No.(s): AD-A350567; No Copyright; Avail: CASI; A08, Hardcopy; A02, Microfiche

Ship survivability is a complex issue. For a ship to remain a viable warfighting asset following damage resulting from enemy munitions such as mines or torpedoes, the ship's crew must remain sufficiently uninjured to be capable of employing the ship's weapons systems. Sophisticated computer simulations of human response, such as those made possible by the Articulated Total Body (ATB) Model, may be used to estimate injury potentials, and thus crew survivability, during underwater explosion events. With this goal in mind, accelerometer data and video footage recorded during live fire testing were used to generate and validate

ATB models for both a seated and a standing Hybrid III Anthropomorphic Test Device (ATD). Subsequently, these models were used to estimate the biodynamic response and injury potentials for both male and female human subjects in a vessel subjected to underwater explosion events. This established a method for evaluating crew survivability for a given underwater explosion induced deck excitation.
DTIC
Human Body; Biodynamics; Underwater Explosions; Females; Males; Human Beings; Human Reactions

19980227144 Army Research Inst. of Environmental Medicine, Natick, MA USA
Casualty Evacuation by Female Litter Teams Under Hot-Dry Conditions
Santee, W. R., Army Research Inst. of Environmental Medicine, USA; Matthew, W. T., Army Research Inst. of Environmental Medicine, USA; Gonzalez, R. R., Army Research Inst. of Environmental Medicine, USA; Jun. 1998; 43p; In English
Report No.(s): AD-A350535; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

A Defense Women's Health Research Program sponsored protocol was conducted at Yuma Proving Ground (YPG), AZ, on 19-27 September 1995. Four female subjects participated in four activities in a hot, dry environment: walk-rest exercise in MOPP-0 and MOPP-4 at 3 mph for a maximum of 2 h 40 min and self-paced, two-person litter carriage with a 68 kg (150 lbs) "casualty" in the same uniforms. Metabolic rates for the walking and self-paced litter carriage tasks were also measured. The results are summarized in Table 1. For walking in MOPP-0, mean endurance time (ET) was 140 plus or minus 40 min and the increase in rectal temperature (Tre) was 0.93 plus or minus 0.27 C vs. an ET of 29 plus or minus 8 min and a Tre of 1.28 plus or minus 0.40 C in MOPP-4. For the litter carriage the ET values in MOPP-0 and MOPP-4 were 59 plus or minus 35 min vs. 43 plus or minus 19 min and for Tre the values were 0.69 plus or minus 0.51 C vs. 0.76 plus or minus 0.41. For walking, the increased physiological strain related to the chemical protective (CP) clothing worn in MOPP-4 was the apparent reason for the reduced activity time on the second day. During both days of litter carriage, the most common reason for termination was skeletal-muscular problems rather than heat stress, but the last subject in MOPP-4 stopped with indicators of thermal strain. This suggests that although muscular-skeletal problems were the proximate limiting factor for most subjects, thermal strain would have occurred within a short time. Mean results for Tre were compared with values predicted by two models: the Heat Strain Decision Aid (HSDA) and the SCENARIO model. Comparisons of predictive modeling results to subject responses show reasonable agreement with mean subject responses for both models.
DTIC
Females; Drying; Protective Clothing; Casualties; Heat Tolerance; Constraints; Teams

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BEHAVIORAL SCIENCES

Includes psychological factors; individual and group behavior; crew training and evaluation; and psychiatric research.

19980223621 NASA Ames Research Center, Moffett Field, CA USA
Centrifuge Study of Pilot Tolerance to Acceleration and the Effects of Acceleration on Pilot Performance
Creer, Brent Y., NASA Ames Research Center, USA; Smedal, Harald A., NASA Ames Research Center, USA; Wingrove, Rodney C., NASA Ames Research Center, USA; Nov. 1960; 38p; In English
Report No.(s): NASA-TN-D-337; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

A research program the general objective of which was to measure the effects of various sustained accelerations on the control performance of pilots, was carried out on the Aviation Medical Acceleration Laboratory centrifuge, U.S. Naval Air Development Center, Johnsville, PA. The experimental setup consisted of a flight simulator with the centrifuge in the control loop. The pilot performed his control tasks while being subjected to acceleration fields such as might be encountered by a forward-facing pilot flying an atmosphere entry vehicle. The study was divided into three phases. In one phase of the program, the pilots were subjected to a variety of sustained linear acceleration forces while controlling vehicles with several different sets of longitudinal dynamics. Here, a randomly moving target was displayed to the pilot on a cathode-ray tube. For each combination of acceleration field and vehicle dynamics, pilot tracking accuracy was measured and pilot opinion of the stability and control characteristics was recorded. Thus, information was obtained on the combined effects of complexity of control task and magnitude and direction of acceleration forces on pilot performance. These tests showed that the pilot's tracking performance deteriorated markedly at accelerations greater than about 4g when controlling a lightly damped vehicle. The tentative conclusion was also reached that regardless of the airframe dynamics involved, the pilot feels that in order to have the same level of control over the vehicle, an increase in the vehicle dynamic stability was required with increases in the magnitudes of the acceleration impressed upon the pilot. In another phase, boundaries of human tolerance of acceleration were established for acceleration fields such as might be encountered by a pilot

flying an orbital vehicle. A special pilot restraint system was developed to increase human tolerance to longitudinal decelerations. The results of the tests showed that human tolerance of longitudinal deceleration forces was considerably improved through use of the special restraint system.
Author
Pilot Performance; Human Tolerances; Flight Simulators; Deceleration; Dynamic Stability; Atmospheric Entry; Centrifuges

19980227093 NASA Langley Research Center, Hampton, VA USA
A Fixed-Base-Simulator Study of the Ability of a Pilot to Establish Close Orbits Around the Moon
Queijo, M. J., NASA Langley Research Center, USA; Riley, Donald R., NASA Langley Research Center, USA; Jun. 1961; 56p; In English
Report No.(s): NASA-TN-D-917; L-1523; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

A study was made on a six-degree-of-freedom fixed-base simulator of the ability of human pilots to modify ballistic trajectories of a S space vehicle approaching the moon to establish a circular orbit about 50 miles above the lunar surface. The unmodified ballistic trajectories had miss distances from the lunar surface of from 40 to 80 miles, and a velocity range of from 8,200 to 8,700 feet per second at closest approach. The pilot was given control of the thrust (along the vehicle longitudinal axis) and torques about all three body axes. The information display given to the pilot was a hodograph of the vehicle rate of descent and circumferential velocity, an altimeter, and vehicle attitude and rate meters.
Author
Circular Orbits; Lunar Landing; Simulators; Lunar Orbits; Orbital Mechanics; Pilot Performance; Descent Trajectories; Lunar Trajectories

54
MAN/SYSTEM TECHNOLOGY AND LIFE SUPPORT

Includes human engineering; biotechnology; and space suits and protective clothing. For related information see also 16 Space Transportation.

19980223933 Naval Aerospace Medical Research Lab., Pensacola, FL USA
Calculating A Helicopter Pilot's Instrument Scan Pattern from Discrete, 60-Hz Measures of the Line-of-Sight: The Evaluation of an Algorithm
Jun. 17, 1998; 33p; In English
Report No.(s): AD-A350657; NAMRL-1403; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

In order obtain data to develop and evaluate theories relating instrument scanning to flight performance we recorded the line of sight (LOS) of student naval helicopter pilots as they flew prescribed maneuvers in a motion-based, high fidelity, instrument training simulator. These LOS data were discrete, 60 Hz samples of eye pointing. For some types of analysis it is helpful to think of a scan pattern as a sequence of fixations and to use an averaging algorithm to transform the 60 Hz data into such a sequence, a scan path. An appropriate algorithm was identified, developed and evaluated. As part of this evaluation, we developed a String Similarity measure, SS, a measure of the similarity between two scan paths. The evaluation of the algorithm, consisting of observing the algorithm's output as a function of the algorithm's parameter values, showed that the algorithm behaved in a sensible fashion, logically consistent with the input data. This increased our confidence in our implementation of the fixation algorithm. The SS metric proved to be an informative, useful tool that may have addition uses in the analysis scanning behavior and flight performance.
DTIC
Helicopters; Scanners; Flight Instruments; Line of Sight; Algorithms; Aircraft Pilots

19980227270 Army Aeromedical Research Lab., Fort Rucker, AL USA
Effects of Head-Supported Devices on Female Aviators during Simulated Helicopter Missions *Annual Report*
Alem, Nabih, Army Aeromedical Research Lab., USA; May 1998; 122p; In English
Report No.(s): AD-A350472; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

This report describes the work completed during the first project year of this research study. The objective of the study is to identify safe weight and location limits of head-supported devices worn by female aviators during simulated helicopter rides. The working hypothesis is that female pilots will tolerate some range of HSD weight moments beyond which their biomechanical and

performance responses will deteriorate. The report contains a review of relevant studies followed by detailed description of the experimental and analytical procedures.
DTIC
Aircraft Pilots; Females; Helicopters; Helmets

19980227315 Oklahoma Univ., School of Industrial Engineering, Norman, OK USA
A Human Factors Perspective on Human External Loads
Shehab, Randa L.; Schlegel, Robert E.; Palmerton, David A.; May 1998; 29p; In English; Prepared in cooperation with the FAA Civil Aeromedical Institute, Oklahoma City, OK.
Contracts/Grants(s): DTFA02-95-T-80473
Report No.(s): AD-A350729; DOT/FAA/AM-98/13; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Title 14 part 133 of the Federal Code of Regulations (14 CFR 133) titled, "Rotorcraft External Load Operations," describes the operation and certification rules governing helicopter external load operations. Specifically, part 133.45 addresses rotorcraft operations involving human external loads (HELs) and the design of personnel lifting devices used in HEL operations. to determine if there is a need for imposing new regulations on HEL operations, the Rotorcraft Standards Directorate of the Aircraft Certification Service requested the Civil Aeromedical Institute to review all available accident databases to determine if HEL operations are unsafe or sufficiently problematic to warrant a change in the existing regulations. This report investigates HEL accidents, categorizes commercially available equipment used in different personnel lifting operations, and provides human-factor related recommendations affecting the use of these HEL lifting devices. A review of accident data between 1973 and 1996 from several databases did not reveal any accident trends or highlight any specific safety issues related to HEL operations. A review of commercially-available HEL equipment showed the devices were designed for either short-term, rescue-type operations or long-term, work-related activities where the user is required to remain in the device for extended periods of time. Suggestions concerning the safety, comfort, and use of HEL devices are provided, as well as recommendations that standard operating procedures, training for HEL crew members, and minimal equipment specifications be added to the current regulation.
DTIC
Human Factors Engineering; Loads (Forces); Safety

19980227326 Air Force Research Lab., Human Effectiveness Directorate, Wright-Patterson AFB, OH USA
Building the I'm'IT/R3 Model of Pilot Trust and Dynamic Workload Allocation: A Transition of Theory and Empirical Observations to Cockpit Demonstration *Final Report, Jan. 1994 - Oct. 1997*
Raeth, Peter G.; Reising, John M.; Feb. 1998; 102p; In English
Contracts/Grants(s): Proj-2403
Report No.(s): AD-A350481; AFRL-HE-WP-TR-1998-0046; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

For pilots to accept active decision aids during complex flight scenarios, it is essential that the automation work is in synergy with aircrew. To accomplish this, the automation must go well beyond menu and macro selections, where the pilot must explicitly tell the automation what to do and when to do it. It must also transcend "mother may I" approaches, where the automation asks for permission to proceed. to these traditional barriers, the automation needs a sense of how the pilot will react in a given situation and, based on that reaction, how much of the workload could be allocated to the automation at any given time. For this purpose, the authors reviewed the literature on human factors and dynamic function allocation. This literature provided a wealth of information on this topic. Based on the current state of the art in this topic area, the authors developed and tested a dynamic model of pilot trust and workload allocation. This "full degrees of freedom" model transitions human factors theory, as it exists today, into an engineering application. The resulting model can be combined with other information obtained from static and continuous processes to divide the workload and minimize cognitive overload.
DTIC
Cockpits; Human Factors Engineering; Decision Support Systems; Artificial Intelligence; Decision Making; Flight Simulation

19980227550 Illinois Univ., Biology Dept., Springfield, IL USA
Can Hydroponic Life Support Systems Resist Invasion by Pathogens?
Jenkins, David G., Illinois Univ., USA; 1997 Research Reports: NASA/ASEE Summer Faculty Fellowship Program; Dec. 1997, pp. 77-92; In English; Also announced as 19980227542; No Copyright; Avail: CASI; A03, Hardcopy; A03, Microfiche

Hydroponic plants are grown at KSC to develop life support capability for long-term space missions. Such systems can be invaded by plant- and human-pathogens, potentially causing plant disease (and consequent disruption of life support) or human disease. This project experimentally tested one method of resisting pathogen invasion: the presence of complex microbial communities in the plant root zone (rhizosphere). For both plant and human-pathogens, data collected to date show microbial community

complexity resisted pathogen invasion, independent of microbial density effects. This result suggests that attempts to mitigate pathogens and their effects in hydroponic life support systems should include early inoculation with complex microbial communities, and provides experimental evidence for ecological theory and the value of complexity in ecological systems.
Author
Hydroponics; Inoculation; Pathogens; Closed Ecological Systems; Plant Diseases; Plants (Botany)

19980227861 Washington State Univ., Biological Systems Engineering, Pullman, WA USA
Modeling Nutrient Mineral Transport in Advanced Life Support Systems
Pitts, Marvin, Washington State Univ., USA; 1997 Research Reports: NASA/ASEE Summer Faculty Fellowship Program; Dec. 1997, pp. 209-218. In English. Also announced as 19980227542. No Copyright; Avail: CASI; A02, Hardcopy; A03, Microfiche

Mass transfer of plant and human nutritional minerals in a Biological Advanced Life Support (BALS) was simulated in a dynamic simulation computer program to determine if deficiencies or toxic levels of minerals would develop in plant or human diets in a BALS. The physical system modeled included one crew member, a biologically active nutrient recovery unit, sufficient plants and hydroponics growing equipment to meet the sustained food requirements of the crew, external resupply of nutrients and an external sink for unrecovered minerals. Crops grown were soybeans, potatoes, wheat, rice and a mixture of green leaf vegetables. Percentages of each crop in the diet were similar to the crop mixture proposed for BIO-Plex, a BALS testbed. Enough of the edible portion of crop mixture to meet the crew's energy needs was ingested daily. Crew waste and inedible plant tissue were decomposed in the nutrient recovery unit, where a portion of the minerals in the waste stream were leached and transferred to the plant nutrient system. As plants grew, they removed minerals essential for plant growth from the solution, leaving nonessential minerals to accumulate in the solution. Unrecovered minerals were removed from the BALS, and mineral deficiencies in the crew diet or plant nutrient solution were made up from external resupply. Three scenarios of mineral recovery were simulated (full recovery, no recovery and partial recovery) to determine if harmful levels of minerals develop in the human diet and in the nutrient solution, how long the nutrient solution could be used before toxic concentrations exist in the solution, and the level of mineral resupplied needed to support a BALS. Simulation results indicated that the human diet is (without supplementation) deficient in some mineral levels, and contains excess, but not harmful, levels of many minerals. Plant deficiency levels and the accumulation of toxic concentrations of minerals in the nutrient system was dependent on the recovery of minerals in the bioreactor. Under partial recovery conditions, 11 grams/(person day) of human and plant nutrient minerals from external sources will be needed, and fluoride will build up to toxic levels in the nutrient solution in 1.25 years. The simulation was verified for correctness with the databases used, but these results should be used with caution because the databases used were incomplete, and required a number of simplifying assumptions for use in the simulation. Improving the nutritional databases and transfer data is needed before this simulation's results are used with confidence.
Author
Closed Ecological Systems; Computerized Simulation; Minerals; Mass Transfer; Vegetation Growth; Nutrients

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Report Documentation Page

1. Report No.	2. Government Accession No.	3. Recipient's Catalog No.
NASA/SP—1998-7011/SUPPL478		

4. Title and Subtitle	5. Report Date
Aerospace Medicine and Biology A Continuing Bibliography (Supplement 478)	November 16, 1998
	6. Performing Organization Code

7. Author(s)	8. Performing Organization Report No.
	10. Work Unit No.
9. Performing Organization Name and Address	
NASA Scientific and Technical Information Program Office	11. Contract or Grant No.

12. Sponsoring Agency Name and Address	13. Type of Report and Period Covered
National Aeronautics and Space Administration Langley Research Center Hampton, VA 23681	Special Publication
	14. Sponsoring Agency Code

15. Supplementary Notes

16. Abstract

This report lists reports, articles and other documents recently announced in the NASA STI Database.

17. Key Words (Suggested by Author(s))	18. Distribution Statement
Aerospace Medicine Bibliographies Biological Effects	Unclassified – Unlimited Subject Category – 52

19. Security Classif. (of this report)	20. Security Classif. (of this page)	21. No. of Pages	22. Price
Unclassified	Unclassified	24	A03/HC

For sale by the NASA Center for AeroSpace Information, 7121 Standard Drive, Hanover, MD 21076-1320

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